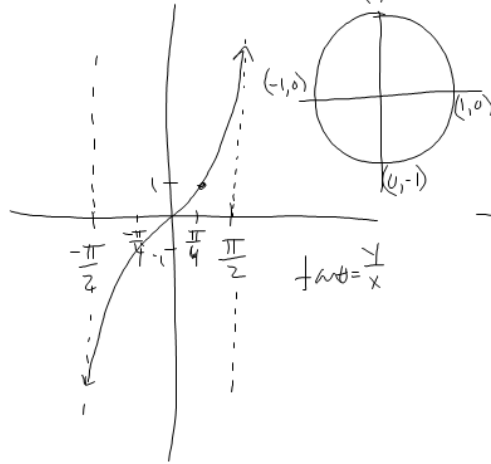
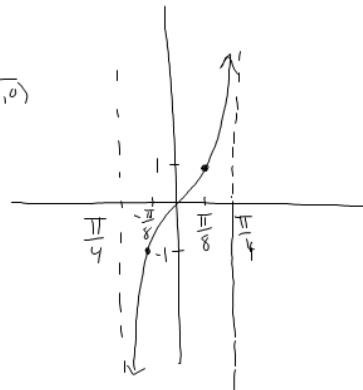


$$y = \tan x$$



$$y = \tan 2x$$

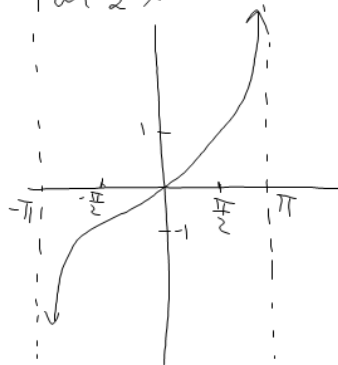


$$p = \frac{\pi}{b} \quad p = \frac{\pi}{2}$$

$$-\frac{\pi}{2} \leq 2x \leq \frac{\pi}{2}$$

$$-\frac{\pi}{4} \leq x \leq \frac{\pi}{4}$$

$$\tan \frac{1}{2} x$$



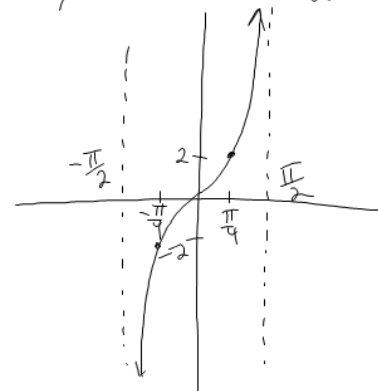
$$-\frac{\pi}{2} \leq \frac{1}{2} x \leq \frac{\pi}{2}$$

$$-\pi \leq x \leq \pi$$

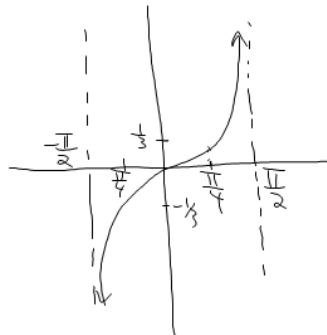
$$p = \frac{\pi}{\frac{1}{2}} = 2\pi$$

$$y = 2 \tan x$$

$$-\frac{\pi}{2} \leq x \leq \frac{\pi}{2}$$

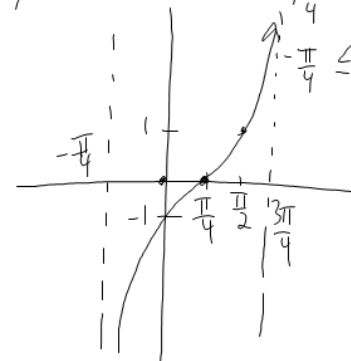


$$y = \frac{1}{3} \tan x$$



$$y = \tan(x - \frac{\pi}{4})$$

$$-\frac{\pi}{2} \leq x - \frac{\pi}{4} \leq \frac{\pi}{2}$$



"Quiz"

Sketch a graph of each function below and give the amplitude, period, frequency, horizontal and vertical shift.

$$(a) f(x) = -\frac{3}{4} \cos \left[2 \left(x - \frac{\pi}{6} \right) \right] + 1$$

$$(b) f(x) = 3 \sin \left[3x + \frac{3\pi}{4} \right] - 4$$

$$(c) f(x) = -\frac{1}{2} \tan \left[\frac{1}{2} \left(x + \frac{\pi}{2} \right) \right] + 2$$

$$(d) f(x) = 2 \csc \left(\frac{x}{2} + \frac{\pi}{3} \right) - 2$$

$$\textcircled{a} f(x) = -\frac{3}{4} \cos \left[2 \left(x - \frac{\pi}{6} \right) \right] + 1$$

$$A = \frac{3}{4} \text{ (positive)}$$

$$P = \frac{2\pi}{2} = \pi$$

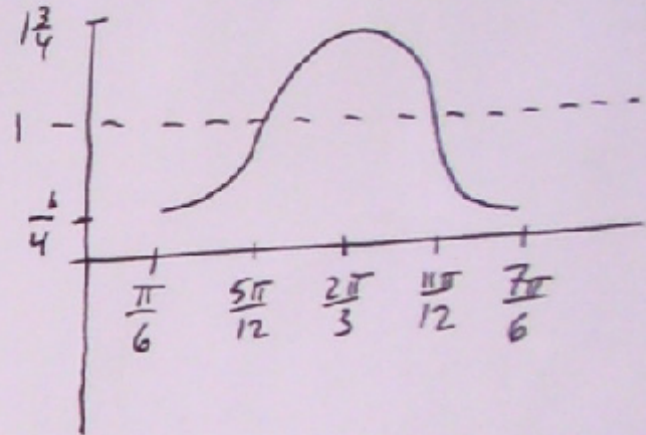
$$F = 2$$

$$\text{H.S. } \frac{\pi}{6} \text{ right}$$

$$\text{V.S. } 1 \text{ up}$$

$$\begin{array}{ccc} 0 \leq x - \frac{\pi}{6} \leq \pi \\ +\frac{\pi}{6} & +\frac{\pi}{6} & +\frac{\pi}{6} \end{array}$$

$$\frac{\pi}{6} \leq x \leq \frac{7\pi}{6}$$



$$\textcircled{b} f(x) = 3 \sin \left(3x + \frac{3\pi}{4} \right) - 4$$

$$A = 3$$

$$P = \frac{2\pi}{3}$$

$$F = 3$$

$$\text{H.S. } = \frac{\pi}{4}$$

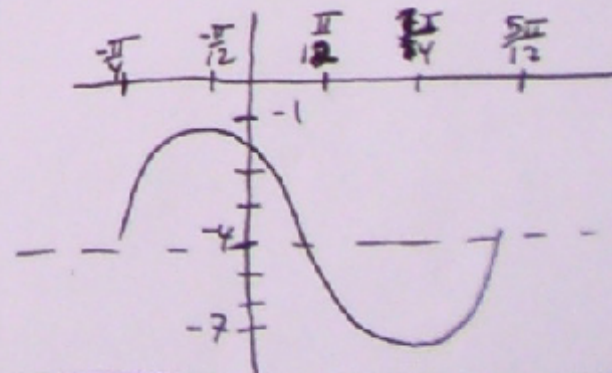
$$\text{left}$$

$$\text{V.S. } = 4 \text{ down}$$

$$\begin{array}{ccc} 0 \leq 3x + \frac{3\pi}{4} \leq 2\pi \\ -\frac{3\pi}{4} & -\frac{3\pi}{4} & -\frac{3\pi}{4} \end{array}$$

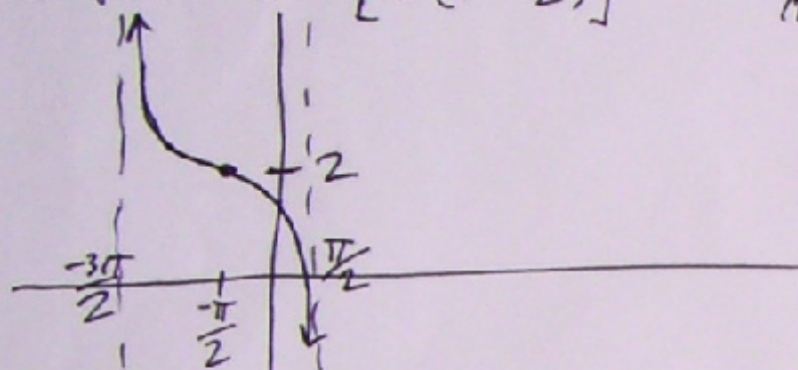
$$\Rightarrow \begin{array}{ccc} -\frac{3\pi}{4} \leq 3x \leq \frac{5\pi}{4} \\ \frac{-3\pi}{3} & \frac{-3\pi}{3} & \frac{5\pi}{3} \end{array}$$

$$-\frac{\pi}{4} \leq x \leq \frac{5\pi}{12}$$



② $f(x) = -\frac{1}{2} \tan\left[\frac{1}{2}\left(x + \frac{\pi}{2}\right)\right] + 2$

$A = \emptyset$, $P = \frac{\pi}{2} = 2\pi$, $F = \frac{1}{2}$, $H.S. = \frac{\pi}{2}$, $V.S. = 2$
1st



$$-\frac{\pi}{2} \leq x + \frac{\pi}{2} \leq \pi$$

$$-\frac{\pi}{2} \quad -\frac{\pi}{2} \quad -\frac{\pi}{2}$$

$$-\frac{3\pi}{2} < x < \frac{\pi}{2}$$

~~or~~ $f(x) = 2 \csc\left(\frac{x}{2} + \frac{\pi}{3}\right) - 2 \Rightarrow 2 \sin\left(\frac{x}{2} + \frac{\pi}{3}\right) = -2$

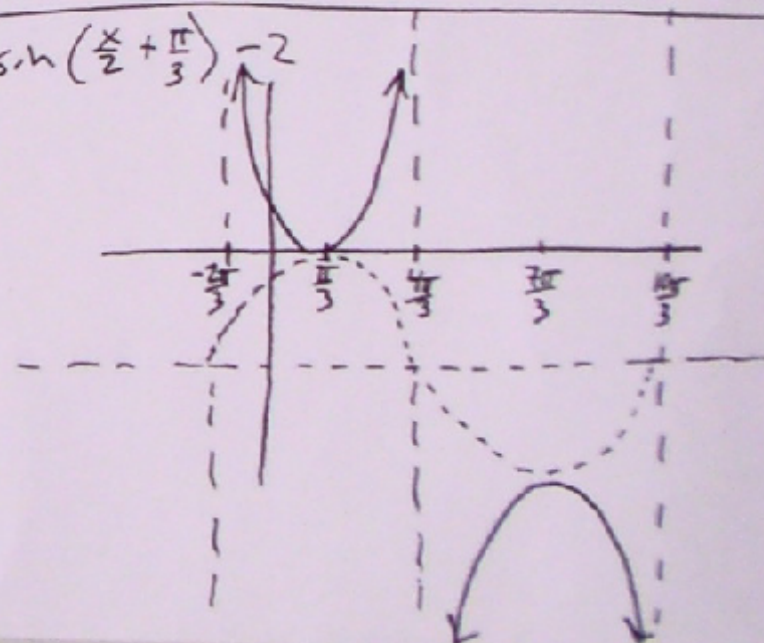
$$0 \leq \frac{x}{2} + \frac{\pi}{3} \leq 2\pi$$

$$-\frac{\pi}{3} \quad \neq \frac{\pi}{3} \quad -\frac{\pi}{3}$$

$$\frac{-\pi}{3} \leq \frac{x}{2} \leq \frac{5\pi}{3}$$

$$\cdot 2 \quad \cdot 2 \quad \cdot 2$$

$$\frac{-2\pi}{3} \leq x \leq \frac{10\pi}{3}$$



Hw

Go back to 4.3 and do 5 more problems